

# Environmental Issues

## Objectives

After this lesson, students will be able to

**E.3.1.1** Identify the general categories of environmental issues.

**E.3.1.2** Describe how decision makers balance different needs and concerns.

## Target Reading Skill

**Identifying Main Ideas** Explain that identifying main ideas and details helps students sort the facts from the information into groups. Each group can have a main topic, subtopics, and details.

## Answers

Three types of environmental issues are resource use, population growth, and pollution.

## All in One Teaching Resources

- [Transparency E23](#)

## Preteach

## Build Background Knowledge

L2

### Defining Issues

Ask: **What is an issue?** (*Students' responses should include the idea of a problem or question on which people have different viewpoints.*) **What are some examples of issues that you have heard about?** (*Possible responses: Should a run-down historic building in town be restored or demolished? Should owners of beachfront property be allowed to restrict public access to beaches?*)

# Environmental Issues

## Reading Preview

### Key Concepts

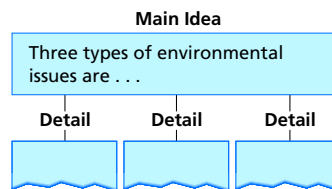
- What are the general categories of environmental issues?
- How do decision makers balance different needs and concerns?

### Key Terms

- natural resource
- renewable resource
- nonrenewable resource
- pollution
- environmental science

## Target Reading Skill

**Identifying Main Ideas** As you read the Types of Environmental Issues section, write the main idea in a graphic organizer like the one below. Then write three supporting details that give examples of the main idea.



## Lab Zone Discover Activity

### How Do You Decide?

1. On a sheet of paper, list the three environmental issues you think are most important today.
2. Next to each issue you have listed, write the reason you think it is important.
3. Form a group with three other classmates. Share your lists. Decide as a group which one of the issues on your lists is the most important.

### Think It Over

**Forming Operational Definitions** Based on your group's discussion, how would you define *environmental issue*?

Here's a riddle for you: What is bigger than the United States and Mexico combined; is covered with more than two kilometers of ice; is a unique habitat for many animals; and is a source of oil, coal, and iron? The answer is Antarctica. Some people think of Antarctica as a useless, icy wasteland. But there are unique wildlife habitats in Antarctica. There are also valuable minerals beneath its thick ice.

Now the question is, What is the best use of Antarctica? Many people want access to its rich deposits of minerals and oil. Others worry that mining will harm its delicate ecosystems. Some people propose building hotels, parks, and ski resorts. But others feel that Antarctica should remain undeveloped. It is not even clear who should decide Antarctica's fate.

In 1998, 26 nations agreed to ban mining and oil exploration in Antarctica for at least 50 years. As resources become more scarce elsewhere in the world, the debate will surely continue.

1000 B.C.  
About 50 million

A.D. 1  
About 285 million



## Discover Activity

**Skills Focus** Forming operational definitions

**Materials** none

**Time** 15 minutes

**Tips** Encourage students to think of specific, *debatable* questions such as "Should people be rewarded for buying smaller, fuel-efficient cars?" "Should

L2

companies be given tax credits for using less product packaging?" and "Should recycling be required?"

**Expected Outcome** Possible answers include pollution or declining resources.

**Think It Over** Definitions should allow for different viewpoints. Encourage students to apply their operational definitions to all of the environmental issues they listed. Have students explore any issues that do not lend themselves to the operational definition.

## Types of Environmental Issues

The debate about Antarctica's future is just one environmental issue that people face today. **Environmental issues fall into three general categories: resource use, population growth, and pollution.** Because these three types of issues are interconnected, they are very difficult to study and solve.

**Resource Use** Anything in the environment that is used by people is called a **natural resource**. Some natural resources are renewable. **Renewable resources** are either always available or are naturally replaced in a relatively short time. Renewable resources include sunlight, wind, fresh water, and trees. Some people think that renewable resources can never be used up. This is not true for some renewable resources. For example, if people cut down trees faster than they can grow back, the supply of this resource will decrease and could possibly run out.

Natural resources that are not replaced in a useful time frame are called **nonrenewable resources**. As nonrenewable resources such as coal or oil are used, the supply decreases.

**Population Growth** Figure 1 shows how the human population has changed in the last 3,000 years. You can see that the population grew very slowly until about A.D. 1650. Around that time, improvements in medicine, agriculture, and waste disposal began to enable people to live longer. The human population has been growing faster and faster since then. However, scientists do not expect the population to grow as rapidly in the future.

When a population grows, the demand for resources also grows. Has your town ever experienced a water shortage? If so, you might have noticed that people have been asked to restrict their water use. This sometimes happens in areas with fast-growing populations. The water supplies in such areas were designed to serve fewer people than they now do, so shortages sometimes occur during unusually warm or dry weather.

A.D. 2000  
About 6 billion

FIGURE 1  
**Human Population Growth**  
More than 6 billion people now live on Earth.  
**Making Generalizations**  
How has the human population changed over the past 1,000 years?

A.D. 1000  
About 300 million

## Instruct

## Types of Environmental Issues

### Teach Key Concepts

L2

#### Real-Life Application

**Focus** Ask: What are some activities that would help protect the environment if a lot of people did them? (Sample answers: Recycling soft-drink cans; putting on a sweater instead of turning up the heat) List each action on the board.

**Teach** Refer to an action and ask: How does this help solve environmental problems?

(Sample answers: Recycling cans reduces the need to mine more aluminum ore, which is a nonrenewable resource. Putting on sweaters reduces our use of heating fuel, another nonrenewable resource.)

**Apply** Tell students that every pound of recycled aluminum saves four pounds of ore. The energy saved from recycling one aluminum can is equivalent to the energy in one cup of gasoline. Ask: **How many recycled aluminum cans would save the energy equivalent of 10 gallons of gasoline?** (2 cups/pint  $\times$  2 pints/quart  $\times$  4 quarts/gallon  $\times$  10 gallons = 160) **learning modality: logical/mathematical**

### Independent Practice

L2

#### All in One Teaching Resources

- [Guided Reading and Study Worksheet: Environmental Issues](#)

 **Student Edition on Audio CD**

## Differentiated Instruction

### English Learners/Beginning Vocabulary: Science Glossary

L1

Pronounce and define vocabulary words aloud. Suggest that students start a personal glossary, with each term and its definition in English on one side of an index card and in the student's primary language on the other side. **learning modality: verbal**

### English Learners/Intermediate Vocabulary: Science Glossary

L2

Students can expand on the activity by adding other unfamiliar terms in this section: *shortage, impact, pollutants, refuge*. Have students write sentences that use each of these words. Call on individuals to read their sentences aloud. **learning modality: verbal**

## Monitor Progress

L2

**Writing** Have each student explain why the world's population has grown so dramatically in the past 350 years. Students can save their explanations in their portfolios.

Portfolio

### Answers

**Figure 1** It has increased by more than 5 billion people.

## Graphing

**Materials** graph paper, ruler, pencil, world map

**Time** 25 minutes

**Focus** Point out to students that Figure 1 shows population growth for the entire world. However, actual growth rates and population sizes vary among different regions and countries of the world.

**Teach** Give students the current populations of several countries listed below and have them construct bar graphs. Have students use their graphs to answer the following questions: **Which country has the largest population?** (*China*) **Which country has the next-largest population?** (*India*) **How many times larger than Japan's population is the U. S. population?** (*About twice as large*)

**Apply** Have students compare the United States' and Japan's land areas on a world map. Ask: **Which country has a greater population density? Explain.** (*Japan; if necessary, help students recall the term population density.*)

**learning modality:** logical/mathematical

2002 Population of Selected Countries	
Brazil	179,914,212
China	1,279,160,885
Great Britain	59,912,431
India	1,034,172,547
Indonesia	231,326,092
Japan	127,065,841
Mexico	102,479,927
Nigeria	130,499,978
Russia	144,978,573
United States	287,675,526

Go Online

For: Links on the environment  
Visit: [www.SciLinks.org](http://www.SciLinks.org)  
Web Code: scn-0531

**Pollution** The contamination of Earth's land, water, or air is called **pollution**. Pollution can be caused by a variety of factors, including chemicals, wastes, noise, heat, and light. Pollution can destroy wildlife and cause human health problems.

Pollution can be related to resource use. As you probably know, the burning of gasoline releases pollutants into the air. With more cars on the road, more gasoline is used, so more pollutants are released into the air.

Pollution can also be related to population growth. For example, as populations grow, and more people need to be fed, more fertilizers and other chemicals may be used to produce that food. As these chemicals run off the land, they can pollute bodies of water.



What are three factors that can cause pollution?

## Science and History

### Making a Difference

Can one individual change the way people think? The leaders featured in this timeline have influenced the way that many people think about environmental issues.

#### 1890 John Muir

The actions of John Muir, a nature writer from California, lead to the establishment of Yosemite National Park.



#### 1905 Gifford Pinchot

Forestry scientist Gifford Pinchot is appointed the first director of the United States Forest Service. His goal is to manage forests scientifically to meet current and future lumber needs.

#### 1903 Theodore Roosevelt

President Theodore Roosevelt establishes the first National Wildlife Refuge on Pelican Island, Florida, to protect the brown pelican.



1880

1900

1920

## Differentiated Instruction

### Gifted and Talented

**Research Report** Invite pairs of students to research one of the following environmental activists.

- **Jacques Cousteau** introduced millions to ocean life and the importance of preserving it.
- **Dian Fossey** urged the preservation of the endangered mountain gorilla of east-central Africa.

L3

- **Jane Goodall** increased our knowledge of the ecology of wild chimpanzees.
- **Chico Mendes** established reserves where rubber could be harvested without causing damage to the Brazilian rain forests. Tell students to present their information in the form of an interview in which one student plays the role of the activist and the other student is the interviewer. **learning modality: verbal**

Go Online

For: Links on the environment  
Visit: [www.SciLinks.org](http://www.SciLinks.org)  
Web Code: scn-0531

Students can review environmental issues in an online activity.



## Making Environmental Decisions

Dealing with environmental issues means making decisions. These decisions can be made at personal, local, national, or global levels. Your decision to walk to your friend's house rather than ride in a car is made at a personal level. A town's decision about how to dispose of its trash is made at a local level. A decision about whether the United States should allow oil drilling in a wildlife refuge is a decision made on a national level. Decisions about how to protect Earth's atmosphere are made on a global level.

Every decision has some impact on the environment. Your personal decisions of what to eat or how to travel have a small impact. But when the personal decisions of millions of people are combined, they have a huge impact on the environment.



### 1962 Rachel Carson

Biologist Rachel Carson writes *Silent Spring*, which describes the harmful effects of pesticides on the environment. The book raises awareness of how human activities can affect the environment.

### 1969 Marjory Stoneman Douglas

At the age of 79, journalist Marjory Stoneman Douglas founds Friends of the Everglades. This grassroots organization is dedicated to preserving the unique Florida ecosystem. She continued to work for the Everglades until her death in 1998.

### 1949 Aldo Leopold

*A Sand County Almanac* is published shortly after the death of its author, Aldo Leopold. This classic book links wildlife management to the science of ecology.



### 1977 Wangari Maathai

Biologist Wangari Maathai founds the Green Belt Movement. This organization encourages restoring forests in Kenya and in other African nations.

1940

1960

1980

## Writing in Science

**Research and Write** Find out more about one of the people featured in this timeline. Write a short biography of the person's life that explains how he or she became involved in environmental issues. What obstacles did the person overcome to accomplish his or her goal?

## Science and History

**Focus** Tell students that organized concern for the environment began to develop after the start of the Industrial Revolution.

**Teach** Focus attention on the timeline, a span of 100 years. As students read about the individuals featured, ask: **Which of these people would you like to learn more about?** (Encourage students to explain their choices and how they would research.)

## Writing in Science

**Writing Mode** Persuasion

### Scoring Rubric

- 4 Includes a complete and accurate description of the person and many interesting details
- 3 Includes a complete and accurate description of person
- 2 Includes only brief but accurate description of person
- 1 Includes inaccurate description

Portfolio

## Making Environmental Decisions

### Teach Key Concepts

L2

#### Value-Based Decision Making

**Focus** Ask: What is an example of something that is balanced? (Sample answer: *A person on a tightrope.*)

**Teach** Draw students' attention to one of the environmental issues discussed in the text, such as the logging issue. Ask: **What needs must be balanced when making this decision?** (Sample answer: *The need to provide jobs, the demand for wood, the need to protect the ecosystem*)

**Apply** Invite students to consider other issues not discussed in the text. **learning modality: verbal**

## Differentiated Instruction

### Gifted and Talented

L3

**Analyzing Issues** Encourage students to research environmental issues in their community, state, or region. Have each group create a skit based on their research.

Suggest that they describe different viewpoints and proposed solutions and include a photograph, graph, or other visual. **learning modality: verbal**

## Monitor Progress

L2

**Writing** Have each student write a paragraph that explains how the actions of an individual can have a significant effect on environmental issues. Students can save their paragraphs in their portfolios.

Portfolio

### Answer



Chemicals, wastes, noise, heat, light

### Comparing Costs and Benefits

**Materials** cost-benefit table

**Time** 20 minutes

**Focus** Suggest that the class develop a cost versus benefit table for one of the environmental issues mentioned in the text.

**Teach** Draw a two-column table on the board or overhead projector. Label the columns *Costs* and *Benefits*. Ask volunteers to suggest entries for the chart. Divide the entries into short-term costs and benefits and long-term ones. Have each volunteer explain why he or she chose the item. Ask volunteers to explain how they determined whether their suggestions were costs or benefits and whether they were short- or long-term.

**Apply** Suggest students listen to daily newscasts for a week or scan a week's worth of newspapers. Students can report on any discussions about the costs and/or benefits of a current environmental issue. **learning modality: logical/mathematical**

**FIGURE 2**  
**Resource Use**

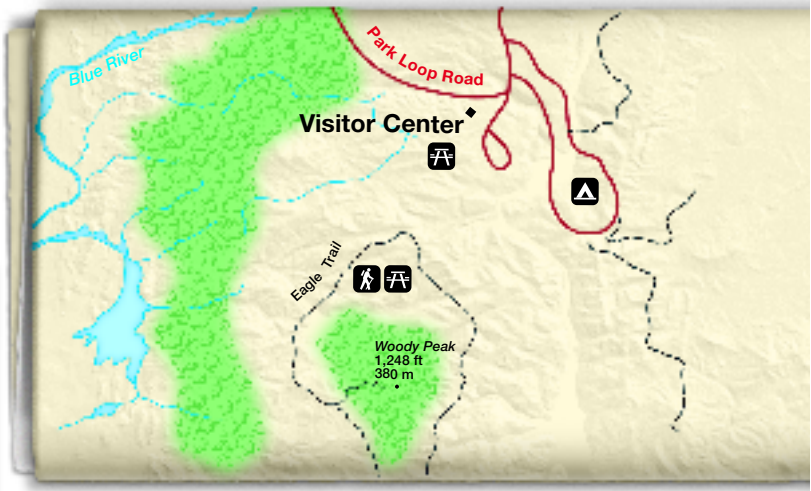
Decisions about undeveloped land must weigh the costs and benefits. Some benefits of parks are shown here.



**Scenic Benefit** The park is a beautiful and peaceful place where we can hike and bird watch.



**Economic Benefit** The trees and other resources of the park provide jobs for loggers and builders.



**Balancing Different Needs** Lawmakers work with many groups to make environmental decisions. One such group is environmental scientists. **Environmental science** is the study of natural processes in the environment and how humans can affect them. But the data provided by environmental scientists are only part of the decision-making process.

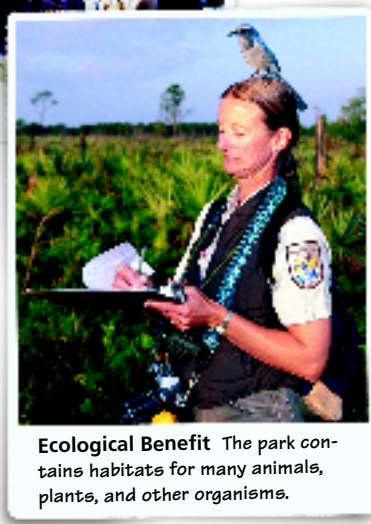
Environmental decision making requires a delicate balance between the needs of the environment and the needs of people. **To help balance the different opinions on an environmental issue, decision makers weigh the costs and benefits of a proposal.**

**Types of Costs and Benefits** Costs and benefits are often economic. Will a proposal provide jobs? Will it cost too much money? But costs and benefits are not only measured in terms of money. For example, suppose a state must decide whether to allow logging in a park. Removing trees changes the ecosystem, which is an ecological cost. However, by providing jobs and needed wood, logging has an economic benefit.

It is also important to consider the short-term and long-term costs and benefits of an environmental decision. A plan's short-term costs might be outweighed by its long-term benefits.

**Weighing Costs and Benefits** Once you have identified the potential costs and benefits of a decision, you must analyze them. Consider the costs and benefits of drilling for oil in Antarctica. There would be many costs. It would be very expensive to set up a drilling operation in such a cold and distant place. Transporting the oil would also be difficult and costly. An oil spill in the seas around Antarctica could harm the fish, penguins, and seals there.





On the other hand, there would be benefits to drilling for oil in Antarctica. Oil drilling would provide a new supply of oil for heat, electricity, and transportation. If the worldwide supply of oil were larger, the price might drop, making oil available to more people. The plan would also create many new jobs. Would the benefits of drilling for oil in Antarctica outweigh the costs? This is the kind of question lawmakers must ask before they make environmental decisions.

**Reading Checkpoint** What are two types of costs and benefits?

## Section 1 Assessment

**Target Reading Skill Identifying Main Ideas** Use your graphic organizer about types of environmental issues to help you answer Question 1 below.

### Reviewing Key Concepts

- a. Identifying** What are the three main types of environmental issues?  
**b. Explaining** Why is population growth an environmental issue?  
**c. Relating Cause and Effect** How might a growing population affect the supply of trees, a renewable resource? Explain your answer.
- a. Reviewing** Why is weighing costs and benefits useful for decision makers?

- b. Classifying** Name one economic cost and one noneconomic cost of drilling for oil in Antarctica. List one benefit of drilling in Antarctica.
- c. Making Judgments** Suppose you were a world leader faced with the question of drilling in Antarctica. What decision would you make? Give reasons for your decision.

### Writing in Science

**Persuasive Letter** Write a letter to the editor expressing your viewpoint on whether people should be allowed to use powerboats on a lake in your town. Your letter should clearly show how you weighed the costs and benefits to arrive at your viewpoint.

## Monitor Progress L2

### Answers

**Reading Checkpoint** *Costs*—expense, possible ecological damage; *benefits*—new supplies of needed materials, jobs

## Assess

### Reviewing Key Concepts

- a.** resource use, population growth, and pollution **b.** As the population grows, the demand for natural resources grows. **c.** Possible answer: Growing demands for housing might increase demands for lumber, which might increase the demand for trees. Increased demand for trees might result in greater harvesting of trees and, therefore, a smaller supply.
- a.** Weighing costs and benefits allows decision makers to balance the differing opinions on an environmental issue. **b.** economic cost: building roads, drilling apparatus, and housing; non-economic cost: disturbance of wildlife habitats; benefit: a new supply of oil **c.** Sample answer: I would vote not to drill for oil in Antarctica. The cost to the environment would be significantly greater than the economic benefits brought by a new source of oil.

### Reteach L1

As a class, list the costs and benefits of damming a river to build a hydroelectric plant.

### Performance Assessment L2

**Skills Check** Have each student choose one action related to an environmental issue. Then have student create a table with the costs of the action listed in one column and the benefits of the action listed in a second column.

### All in One Teaching Resources

- [Section Summary: Environmental Issues](#)
- [Review and Reinforce: Environmental Issues](#)
- [Enrich: Environmental Issues](#)

## Lab zone Chapter Project

**Keep Students on Track** Make sure students leave enough space between plots so that they can move around. Encourage students to note any animals behaviors they see, such as feeding, fighting, or cooperating in some way.

### Writing in Science

**Writing Mode** Persuasion

#### Scoring Rubric

- Includes description of the issue, economic and noneconomic costs and benefits, explanation of how costs and benefits were weighed
- Includes three of the four criteria and a brief explanation
- Includes one or two of the criteria and some accurate details
- Includes only descriptive details



## Recycling Paper

L2

### Prepare for Inquiry

#### Key Concept

Paper is a renewable resource because it can be recycled.

#### Skills Objectives

After this lab, students will be able to

- observe and compare dry newspaper and recycled paper made from newspaper pulp
- predict how the structure of paper changes when it is recycled



**Prep Time** 15 minutes

**Class Time** 15 minutes on Day 1, 40 minutes on Day 2, 10 minutes on Day 3

#### Advance Planning

Gather an ample supply of old newspapers.

#### Safety



Students should handle the microscope slide carefully to avoid breakage.

Review the safety guidelines in Appendix A.

#### All in One Teaching Resources

- [Lab Worksheet: Recycling Paper](#)

### Guide Inquiry

#### Invitation

Ask: **What process do you think you can use to recycle newspapers?** (*Student answers should reflect an understanding of the procedure, including the making of paper pulp and drying the paper.*)

#### Introducing the Procedure

Emphasize to students that they will do the lab on three different days: Steps 1–2 on Day 1, Steps 3–6 on Day 2, and Step 7 on Day 3.

#### Troubleshooting the Experiment

- *Day 1:* In Step 1, ask: **What do you see in the paper?** (*Fibers*)
- *Day 2:* Have students reread Steps 3–6. Remind them to replace the newspaper under the screen each day if it is still wet.
- *Day 3:* Make certain the pulp is completely dry before students handle it.

#### Expected Outcome

The dried pulp will be rough, stiff, and grayish—like cardboard egg cartons. Cellulose fibers will be visible.

## Recycling Paper

### Problem

Is paper a renewable resource?

### Skills Focus

observing, predicting

### Materials

- newspaper
- microscope
- water
- eggbeater
- square pan
- screen
- plastic wrap
- mixing bowl
- heavy book
- microscope slide

### Procedure



1. Tear off a small piece of newspaper. Place it on a microscope slide and examine it under a microscope. Record your observations.
2. Tear a sheet of newspaper into pieces about the size of postage stamps. Place the pieces in the mixing bowl. Add enough water to cover the newspaper. Cover the bowl and let the mixture stand overnight.
3. The next day, add more water to cover the paper if necessary. Use the eggbeater to mix the wet paper until it is smooth. This thick liquid is called paper pulp.
4. Place the screen in the bottom of the pan. Pour the pulp onto the screen, spreading it out evenly. Then lift the screen above the pan, allowing most of the water to drip into the pan.
5. Place the screen and pulp on several layers of newspaper to absorb the rest of the water. Lay a sheet of plastic wrap over the pulp. Place a heavy book on top of the plastic wrap to press more water out of the pulp.

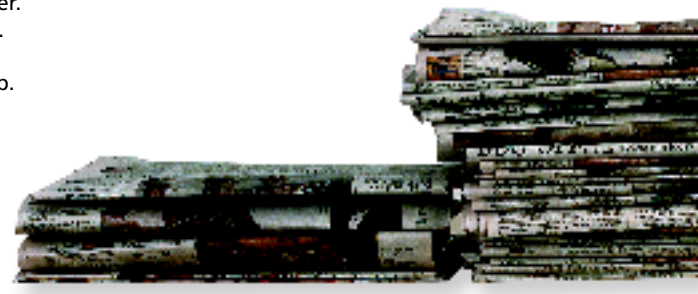
6. After 30 minutes, remove the book. Carefully turn over the screen, plastic wrap, and pulp. Remove the screen and plastic wrap. Let the pulp sit on the newspaper for one or two more days to dry. Replace the newspaper layers if necessary.
7. When the pulp is dry, observe it closely. Record your observations.

### Analyze and Conclude

1. **Observing** What kind of structures did you observe when you examined torn newspaper under a microscope?
2. **Inferring** What are these structures made of? Where do they come from?
3. **Predicting** What do you think happens to the structures you observed when paper is recycled? How do you think this affects the number of times paper can be recycled?
4. **Communicating** Based on what you learned in this lab, do you think paper should be classified as a renewable or nonrenewable resource? Defend your answer with evidence and sound reasoning.

### Design an Experiment

Using procedures like those in this lab, design an experiment to recycle three different types of paper, such as shiny magazine paper, paper towels, and cardboard. *Obtain your teacher's permission before carrying out your investigation.* How do the resulting papers differ?



### Analyze and Conclude

1. Fibers
2. The fibers are made of plant material. They come from the plants used to make the paper.
3. When the paper is soaked and mashed, the fibers are broken. When the pulp is flattened and dried, the fibers intertwine. Each time the fibers are broken, the result is a weaker paper, which limits the number of times it can be recycled.
4. Paper is a renewable resource. It can be recycled, and new trees can be planted.

### Extend Inquiry

**Design an Experiment** Students' plans should be similar to the lab procedure. Have students share their results.